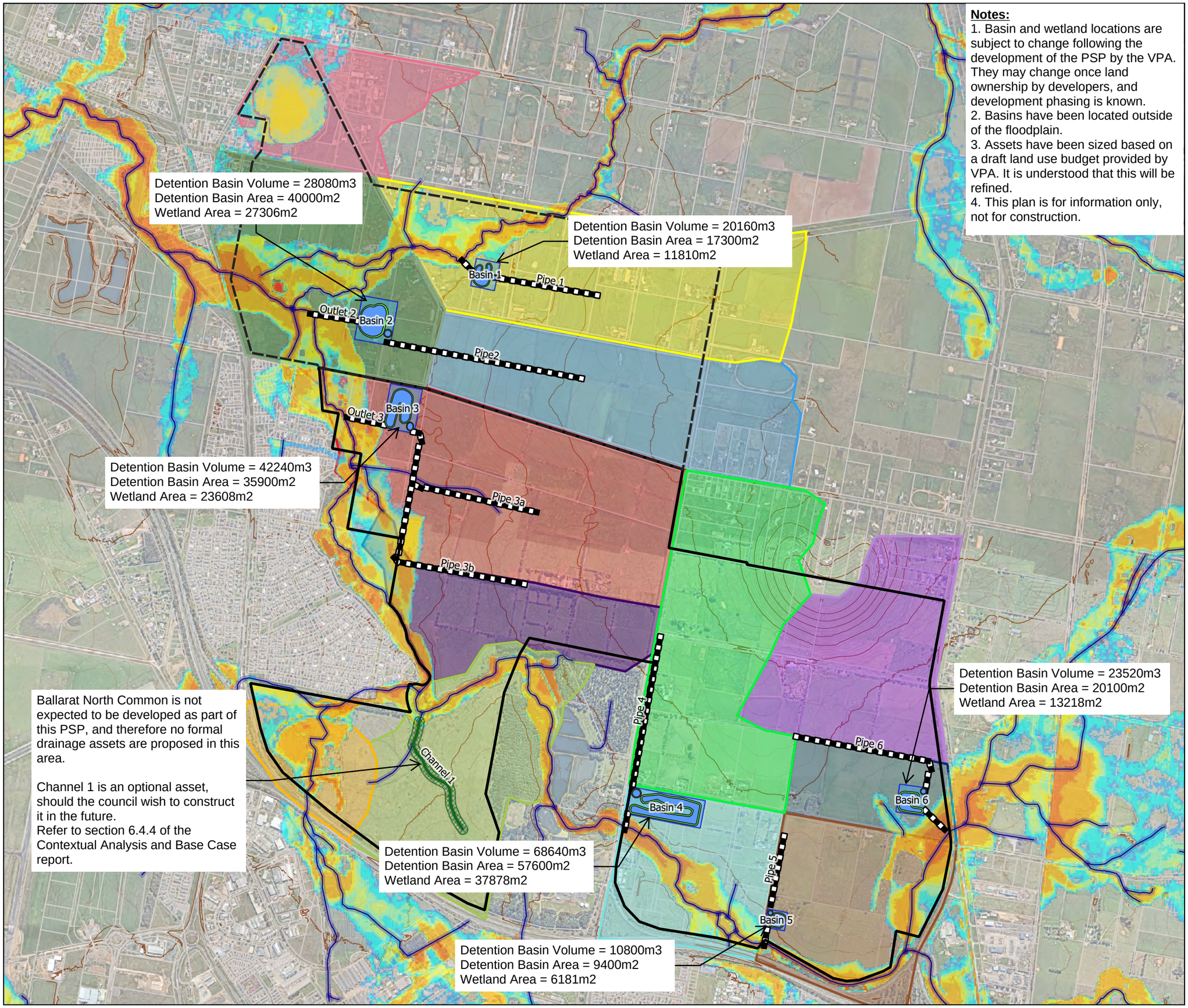

Notes:

1. Basin and wetland locations are subject to change following the development of the PSP by the VPA. They may change once land ownership by developers, and development phasing is known.
2. Basins have been located outside of the floodplain.
3. Assets have been sized based on a draft land use budget provided by VPA. It is understood that this will be refined.
4. This plan is for information only, not for construction.

Legend

- Channel
- Pipe
- Channel Buffer
- Detention Basin Footprint
- Wetland Markup
- Watercourse
- Cadastre
- Elevation Contours (2m)
- Elevation Contours (10m)

PSP Boundary

- Core
- Expanded

Subareas

- CN
- CP
- CT
- CW
- CY
- CZ
- DA
- DB
- DD
- DE
- DI
- CR
- CM

Flood Depth (m) 1% AEP CC

- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.30
- 0.30 - 0.40
- 0.40 - 0.50
- 0.50 - 1.00
- 1.00 - 2.50
- > 2.50

Project Title

Ballarat North PSP

Drawing Title

Catchment Plan and Drainage Schematic

Job No	Figure No
296790-00	**Appendix C**
Coordinate System **GDA2020 MGA Zone 54**	Drawing Status **Draft**

Scale

0 200 400 600 800 1,000 m

Issue	Date	By	Chkd	Appd
A	08/12/23	SS	PW	CM

Client

Victorian Planning Authority

Consultant

ARUP

Sky Park, One Melbourne Quarter, 699 Collins Street, Docklands, VIC 3008, Australia

Disclaimer

N

Sources: Victorian Planning Authority, VicMap, NearMap

Appendix D

IWM Assessment scoring

D.1.1 Score breakdown of IWM assessment against key criteria for Scenario A

Option	Alternative water sources that substitutes potable mains water supply (ML/year)	Volume of recycled water delivered to residents (ML/year)	Impact on downstream fluvial flood mitigation (H/M/L)	Reduction in Mean annual runoff volume (ML/year)	Total Nitrogen (TN) prevented from discharging to receiving waters (kg/year)	Alternative water supporting urban greening (H/M/L)	New green infrastructure or permeable space created (ha)	Wadawurrung statement: Restoring Country to its natural state (H/M/L)	Opportunity to enhance community awareness and engagement (H/M/L)	Opportunity to create linked corridors to support connections (H/M/L)	Ease of Implementation (H/M/L)	Ease of operation and maintenance (H/M/L)
1a	0	0	1	2	1	0	3	1	2	0	3	2
2a	0	0	3	0	3	0	1	1	1	0	3	3
3a	0	0	1	0	2	0	0	1	1	1	3	2
4a	2	2	0	0	1	3	0	1	1	0	2	2
5a	3	3	0	0	3	0	0	1	2	0	2	2
6a	1	0	2	2	0	3	0	1	1	0	2	2
7a	2	0	2	3	0	0	0	1	2	0	1	2
8a	0	0	2	1	0	0	3	1	2	3	2	2
9a	0	0	2	1	0	0	3	2	2	2	2	3
10a	0	0	1	1	0	1	1	1	2	0	2	2
11a	0	0	1	1	0	3	0	1	2	1	2	2
12a	2	0	2	3	0	0	0	1	3	0	2	2
13a	0	0	1	3	0	0	0	1	3	0	1	2
14a	0	0	1	1	0	1	3	1	3	0	1	2
15a	0	0	1	1	0	1	1	1	3	0	1	1

D.1.2 Score breakdown of IWM assessment against key criteria for Scenario B

Option	Alternative water sources that substitutes potable mains water supply (ML/year)	Volume of recycled water delivered to residents (ML/year)	Impact on downstream fluvial flood mitigation (H/M/L)	Reduction in Mean annual runoff volume (ML/year)	Total Nitrogen (TN) prevented from discharging to receiving waters (kg/year)	Alternative water supporting urban greening (H/M/L)	New green infrastructure or permeable space created (ha)	Wadawurrung statement: Restoring Country to its natural state (H/M/L)	Opportunity to enhance community awareness and engagement (H/M/L)	Opportunity to create linked corridors to support connections (H/M/L)	Ease of Implementation (H/M/L)	Ease of operation and maintenance (H/M/L)
1b	0	0	1	2	1	0	3	1	2	0	3	2
2b	0	0	3	0	3	0	1	1	1	0	3	3
3b	0	0	1	0	3	0	0	1	1	1	3	2
4b	2	2	0	0	1	3	0	1	1	0	2	2
5b	3	3	0	0	3	0	0	1	2	0	2	2
6b	2	0	2	3	0	3	0	1	1	0	2	2
7b	3	0	2	3	0	0	0	1	2	0	1	2
8b	0	0	2	2	0	0	3	1	2	3	2	2
9b	0	0	2	2	0	0	3	2	2	2	2	3
10b	0	0	1	1	0	1	1	1	2	0	2	2
11b	0	0	1	1	0	3	0	1	2	1	2	2
12b	3	0	2	3	0	0	0	1	3	0	2	2
13b	0	0	1	3	0	0	0	1	3	0	1	2
14b	0	0	1	1	0	1	3	1	3	0	1	2
15b	0	0	1	1	0	1	1	1	3	0	1	1

Appendix E

Workshop outputs

ARUP

Victorian Planning Authority

Ballarat North
IWM Assessment and Options

Thursday 1st February 13.00-15.00

2.5 hours

Activity 1 - Defining Outcomes

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What are the wider strategic outcomes that are important for this place/ project?

Exercise instructions

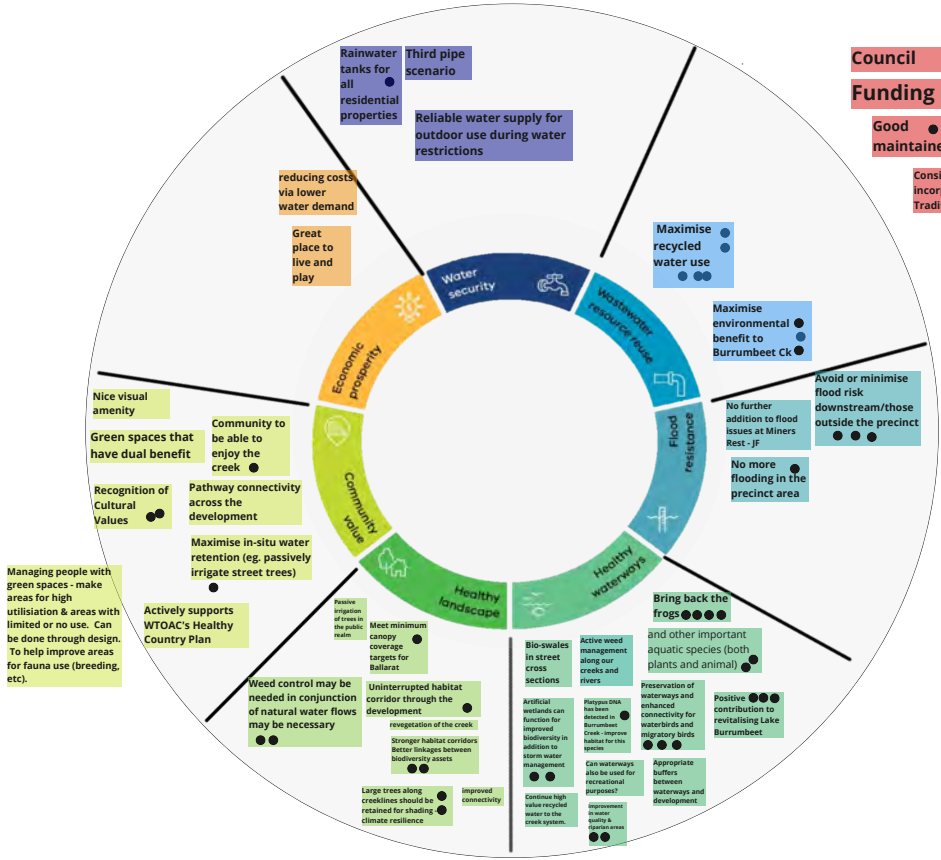
1.Define Outcomes (20 mins)

- Reflecting on the context of Ballarat North PSP, identify what wider outcomes should be considered?
- Individually, place the outcomes cards inside the wheel in the relevant section.
- Add more detail about the outcome in the card's text box.
- Use blank cards to generate new outcomes.

2. Prioritise Outcomes (10 mins)

- Individually, use coloured dots to vote for three outcomes that you think should be prioritised.

Exercise time 30 minutes



Council

Funding

Clear responsibilities between stakeholders

Good maintainence

Willing developers

Having clear guidance throughout the process from PSP to implementation that is place specific

Consideration of and incorporation of Traditional Owner values

Activity 2 - IWM Opportunities

What are the water cycle interventions that can unlock wider outcomes and address water challenges?

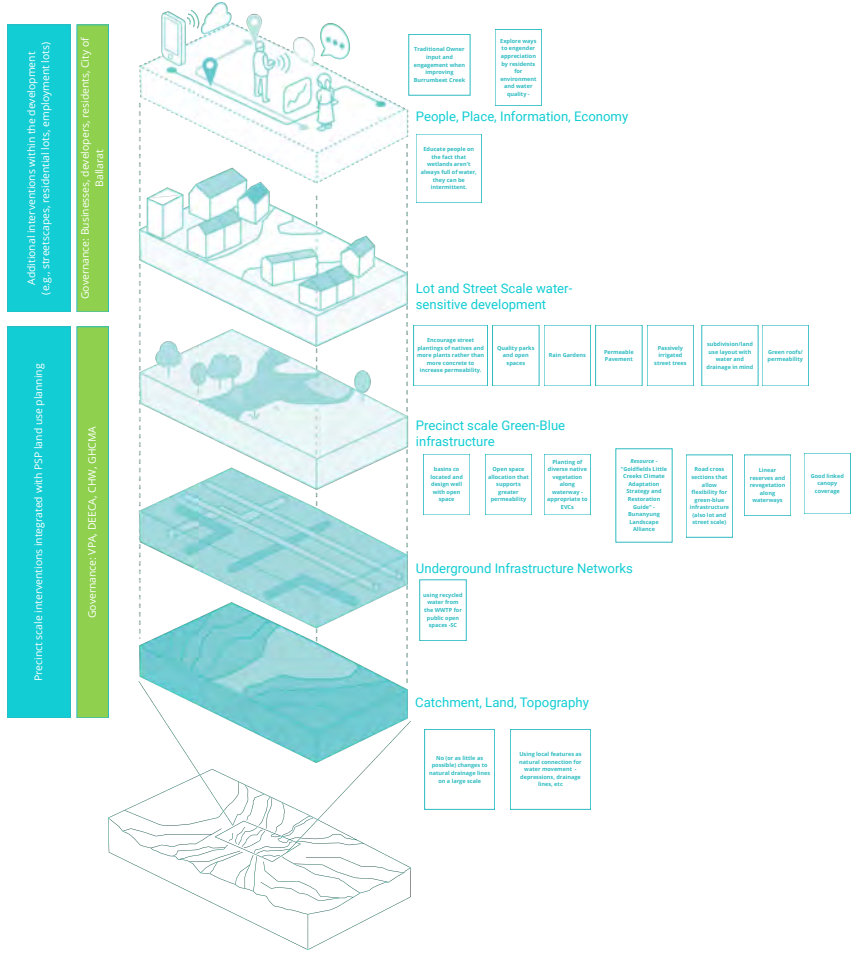
Exercise instructions

- Consider what water infrastructure assets can be used to unlock wider outcomes?
- Place selected water asset on the relevant water system layer.
- In group share your ideas.

Optional

- Map interdependencies between the assets using Miro arrow tool.

Exercise time
30 minutes



Long list of IWM options from Workshop 1

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Layer	IWM opportunity	Shortlisted for assessment?	Comment
Catchment, land, topography	No (or as little as possible) changes to natural drainage lines on a large scale / Using local features as natural connection for water movement – depressions, drainage lines, etc.	N	There is opportunity to inform overland flood flow paths by influencing placement of roads. This will ultimately be to the discretion of the VPA, based on other outcomes that need to be achieved in the PSP guidelines, however, this solution can be assessed by identifying existing low-lying areas using topographic data, and encourage overland flow paths to these naturally occurring low points before discharging into the creek.
			For natural connections for water movement, swales have been proposed (under the Lot and street scale water sensitive development layer) which will be assessed at the next stage.
Underground infrastructure networks	Using recycled water from Ballarat North WWTP for public open spaces	Y	This solution will be assessed in the next stage.
Precinct Scale blue-green infrastructure	Road cross sections that allow flexibility for green-blue infrastructure (also lot and street scale)	Y	Streetscape WSUD features such as swales and passively irrigated trees will be assessed in the next stage.
	Basins co-located and designed well with open space	N	The first milestone of this study proposed that basins and wetlands can be co-located to minimise land take. Exact locations will be dependent on how the masterplan progresses and developers come on board, but Arup will be able to make suggestions on open space locations to the VPA.
Lot and street scale water sensitive development	Rainwater tanks for all residential properties	Y	This solution will be assessed in the next stage.
	Bio-swales in street cross sections	Y	This solution will be assessed in the next stage.
	Encourage street plantings of natives and more plants rather than more concrete to increase permeability.	N	This is recommended is to be taken forward by the VPA and incorporated into the PSP, as it is listed as a general principal (F12) in the PSP guidelines. This will not be quantitively assessed at the next stage.
	Rain Gardens	Y	This solution will be assessed in the next stage.
	Permeable Pavement	Y	This solution will be assessed in the next stage.
	Passively irrigated street trees	Y	This solution will be assessed in the next stage.
	Green roofs	Y	This solution will be assessed in the next stage.
People, place, information and economy	Traditional Owner input and engagement when improving Burrumbeet Creek	Y	VPA are in communication with WTOAC and Traditional Owner input has been incorporated into the IWM assessment
	Explore ways to engender appreciation by residents for environment and water quality	N	Although this solution won't be quantitatively assessed as it pertains to the post-PSP stage, it will be included in our final recommendations.
	Educate people on the fact that wetlands aren't always full of water, they can be intermittent.	N	Although this solution won't be quantitatively assessed as it pertains to the post-PSP stage, it will be included in our final recommendations.

List of options assessed

ARUP

- **All options have been assessed for the Core area only, and Core area plus Expanded area**

		Option
1	Precinct	To improve the water quality of Burrumbeet Creek, stormwater runoff is treated by wetlands
2		Allow for adequate land for floodwater storage(retarding basins) to control 1% AEP post developed flows to pre-developed levels.
3		Stabilisation of Burrumbeet Creek to accept urbanised flows
4		Using recycled water from Ballarat North WWTP for public open spaces
5		Using recycled water from Ballarat North WWTP for residential use
6		Stormwater harvesting and reuse for public open spaces from wetland
7		Stormwater harvesting and reuse for residential (laundry, flush and outdoor irrigation) from wetland
8		Blue-green corridors
9		Provide ecological refuge and resilience for flora and fauna residing within Burrumbeet Creek
10	Street	Bioretention systems to treat road runoff
11		Passive street tree irrigation
12	Lot	Rainwater harvesting in all households
13		Permeable pavement in all household driveways
14		Green roofs in non residential buildings
15		Household driveways and roofs connected to raingardens

Precinct scale solutions

ARUP

To improve the water quality of Burrumbeet Creek, stormwater runoff is treated by wetlands

Allow for adequate land for floodwater storage (retarding basins) to control 1% AEP post developed flows to pre-developed levels

Using recycled water from Ballarat North WWTP for public open spaces and residential use.

Provide ecological refuge and resilience for flora and fauna residing within Burrumbeet Creek

Stormwater harvesting and reuse for public open spaces and non-potable residential use from wetland.

Blue-green corridors

Stabilisation of Burrumbeet Creek to accept urbanised flows

Street scale solutions

ARUP

Passive street tree irrigation

Bioretention systems to treat road runoff

Lot scale solutions

ARUP

Rainwater harvesting in all households

Household driveways and roofs connected to raingardens

Permeable pavement in all household driveways

Green roofs in non residential buildings

Assessment criteria

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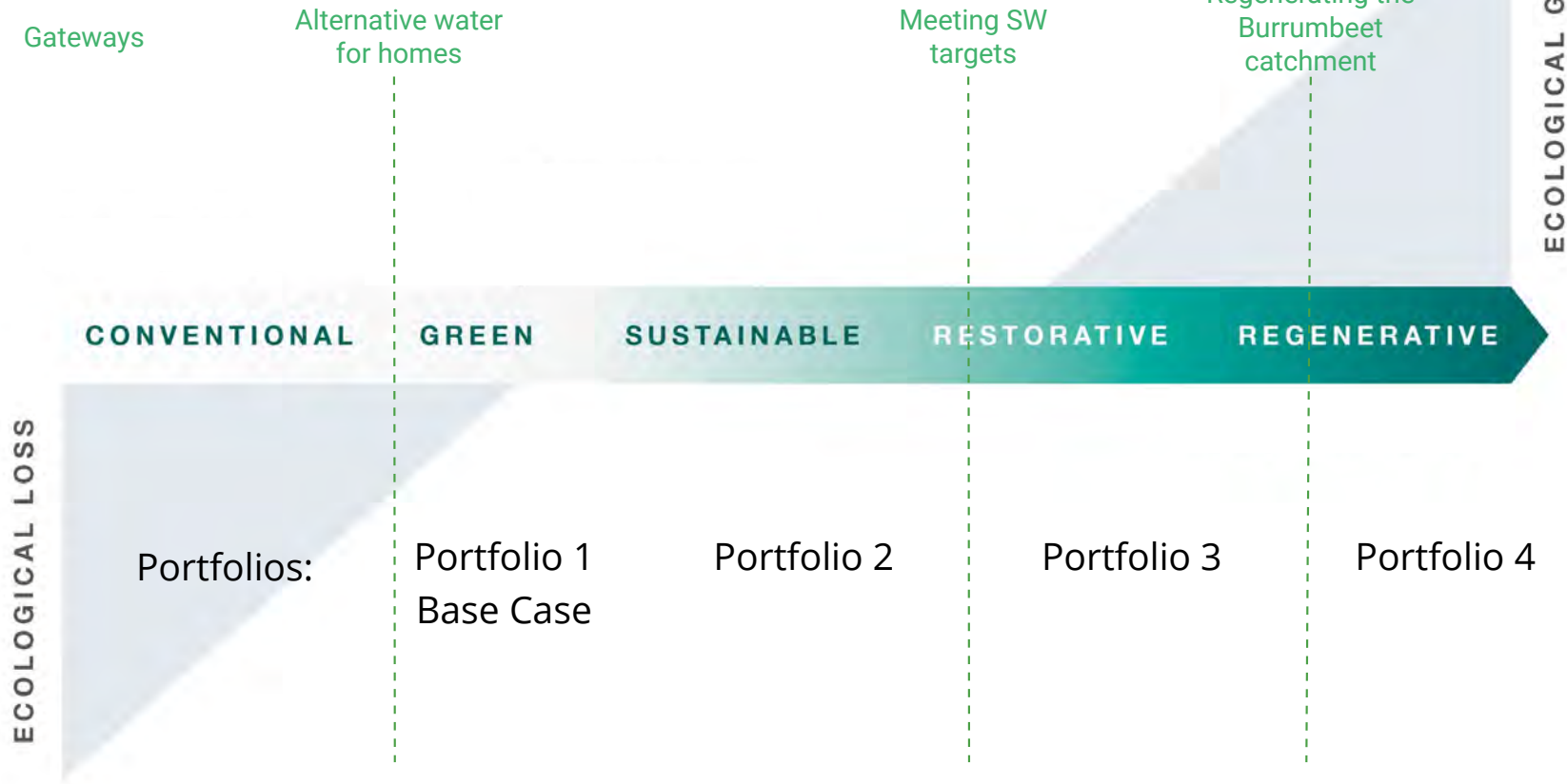
New table

Strategic Outcome (from the Central Highlands Strategic Directions Statement)	Place-based IWM objective for Ballarat North	Measure	Unit
Strategic Outcome 1 – Safe, secure and affordable supplies in an uncertain future 	Reduce potable water demand to reduce pressure on Ballarat's supplies and provide adaptability during drought.	Alternative water sources that substitutes potable mains water supply	ML/year
Strategic Outcome 2 – Effective and affordable wastewater systems 	Utilise future wastewater flows to Ballarat North WWTP for beneficial local outcomes.	Volume of recycled water delivered to residents	ML/year
Strategic Outcome 3 – Existing and future flood risks are managed to maximise outcomes for the community 	Manage flood flows from the development area to prevent any increase in flood risk downstream.	Impact on downstream fluvial flood mitigation	H/M/L
Strategic Outcome 4 – Healthy and valued waterways and marine environments 	Protect and improve ecological value and habitat potential of Burrumbeet Creek. Reduce stormwater runoff and improve stormwater quality flowing to Burrumbeet creek to support waterway health	Reduction in Mean annual runoff volume	ML/year
		Total Nitrogen (TN) prevented from discharging to receiving waters	tonnes/year
Strategic Outcome 5 – Healthy and valued urban and rural landscapes 	Create greener neighbourhoods, supporting trees and enhancing open space. Create additional landscapes, permeable areas and green infrastructure through water management	Alternative water supporting urban greening	H/M/L
		New green infrastructure or permeable space created	ha
Strategic Outcome 6 – Community values are reflected in place-based planning 	Create green-blue corridors within the development and support connections and community access to and awareness of nature. Embed Traditional Owner values and care for country	Wadawurrung statement criteria: 1. Minimises wastewater discharging to the creek 2. Minimises stormwater discharging to the creek, 3. Creek restoration	Number of criterion met
		Opportunity to enhance community awareness and engagement	H/M/L
		Opportunity to create linked corridors to support connections	H/M/L
Strategic Outcome 7 – Jobs, economic benefits and innovation 		This strategic outcome is not applicable to Ballarat North as it is primarily a residential precinct	N/A
Additional delivery criteria: Ease of delivery	Adopt a fair and equitable approach to IWM, ensuring all stakeholders contribute to the place based IWM Objectives.	Ease of implementation	H/M/L
		Ease of operation and maintenance	H/M/L

Our Approach to grouping options



Portfolio 1 - Base Case

ARUP

PRECINCT SCALE

Wetland to meet pollutant reduction targets (Option 1)

Retarding basins to control 1% AEP post development flows (Option 2)

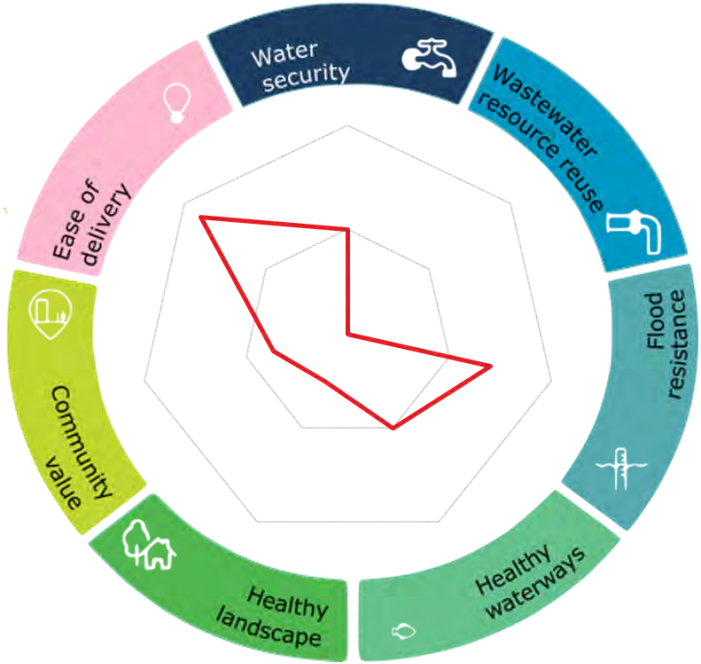
Stabilisation of Burrumbeet Creek to accept urbanised flows from all of Ballarat North PSP (Option 3)

LOT / STREET SCALE

2kL rainwater tanks in households (Option 12)

Portfolio 1

ARUP



Portfolio 2

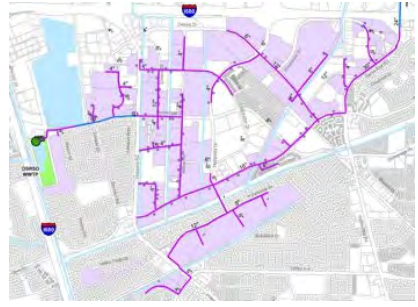
ARUP

PRECINCT SCALE

- Recycled water to open spaces (Option 4)
- Recycled water to homes (Option 5)
- Wetland to meet pollutant reduction targets (Option 1)
- Retarding basins to control 1% AEP post development flows (Option 2)
- Stabilisation of Burrumbeet Creek to accept urbanised flows from all of Ballarat North PSP (Option 3)

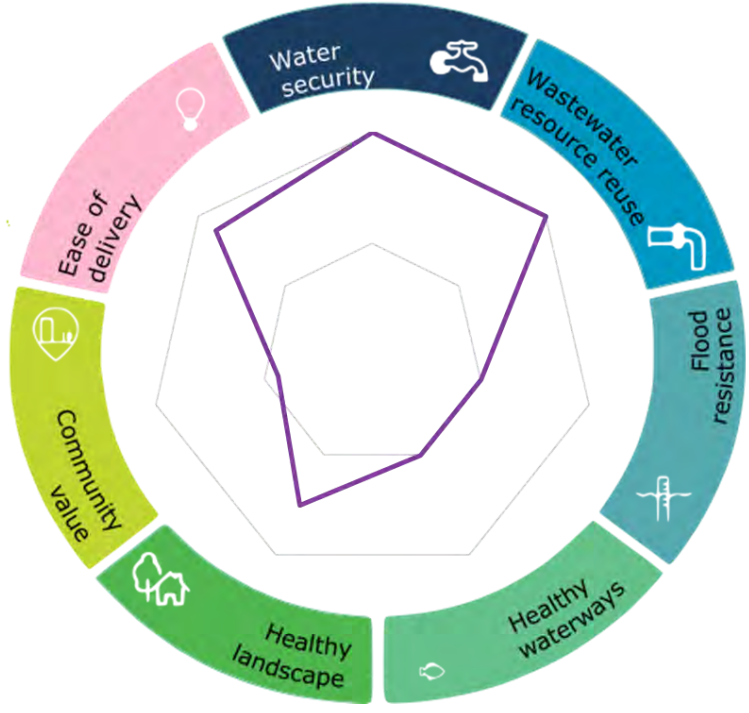
LOT/ STREET SCALE

- Passive street tree irrigation (Option 11)



Portfolio 2

ARUP



Portfolio 3

ARUP

PRECINCT SCALE

- Precinct scale stormwater harvesting for open spaces (Option 6)
- Stabilisation of Burrumbeet Creek to accept urbanised flows from all of Ballarat North PSP (Option 3)
- Retarding basins to control 1% AEP post development flows (Option 2)
- Wetland to meet pollutant reduction targets (Option 1)

LOT / STREET SCALE

- Household driveways and roofs connected to raingardens (Option 15)
- Bioretention systems to treat road runoff (Option 10)
- 2kL rainwater tanks in households (Option 12)

Portfolio 3

ARUP

Portfolio 4

ARUP

PRECINCT SCALE

- Provide ecological refuge and resilience for flora and fauna residing within Burrumbeet Creek (Option 9)
- Recycled water to homes (Option 5)
- Precinct scale stormwater harvesting for open space (Option 6)
- Blue-green corridors within the PSP (Option 8)
- Stabilisation of Burrumbeet Creek to accept urbanised flows from all of Ballarat North PSP (Option 3)
- Retarding basins to control 1% AEP post development flows (Option 2)
- Wetland to meet pollutant reduction targets (Option 1)

Portfolio 4

ARUP

Comparison

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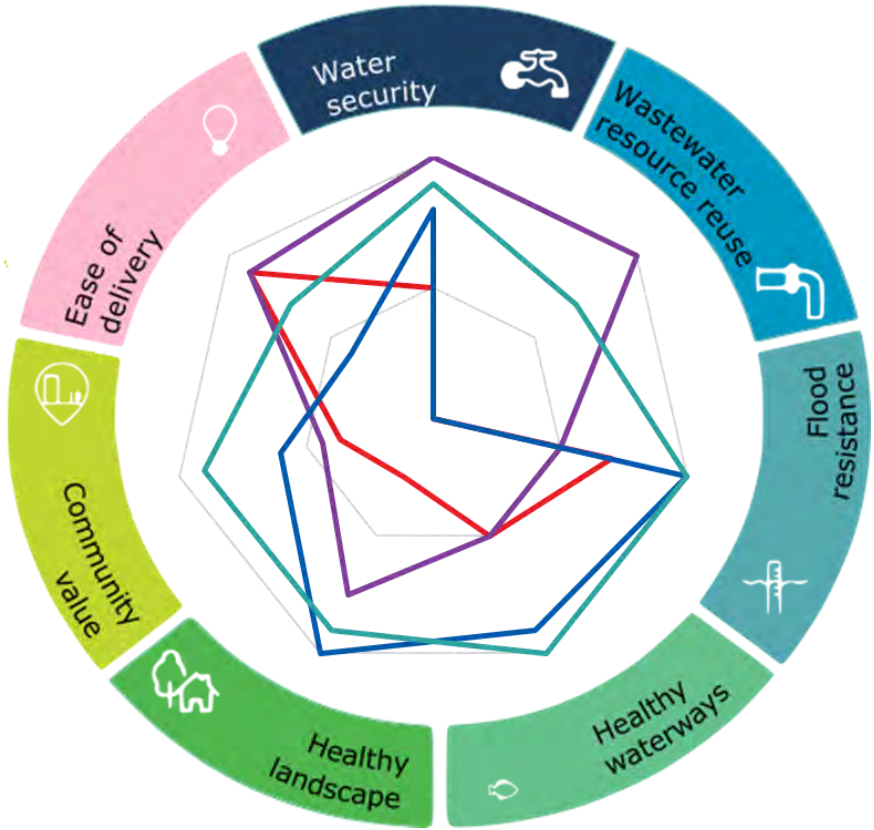
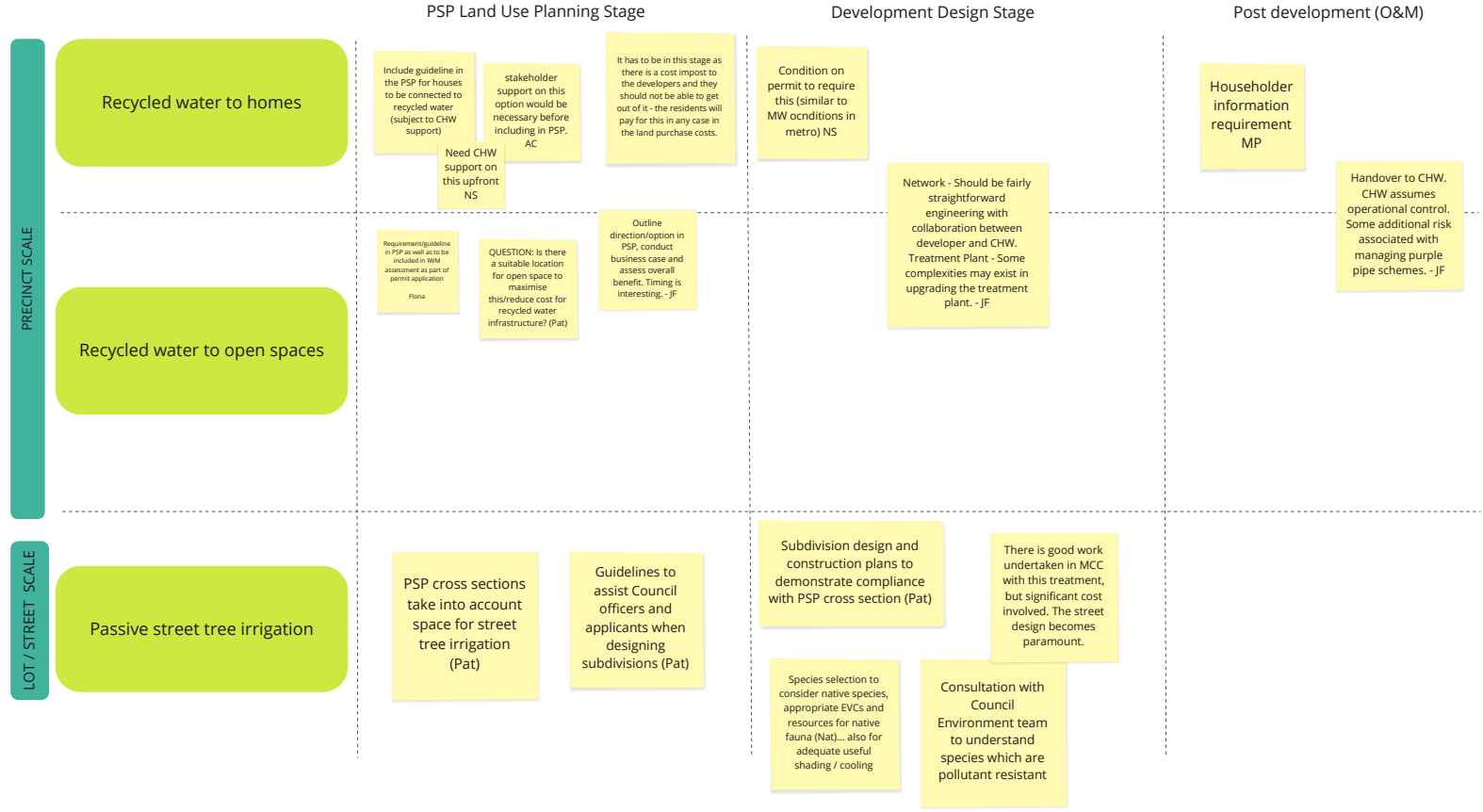


Activity - Delivery Pathways - Sustainable industry best practice

ARUP

Exercise time
15 minutes

WHAT NEEDS TO BE CONSIDERED AT THE FOLLOWING STAGES?

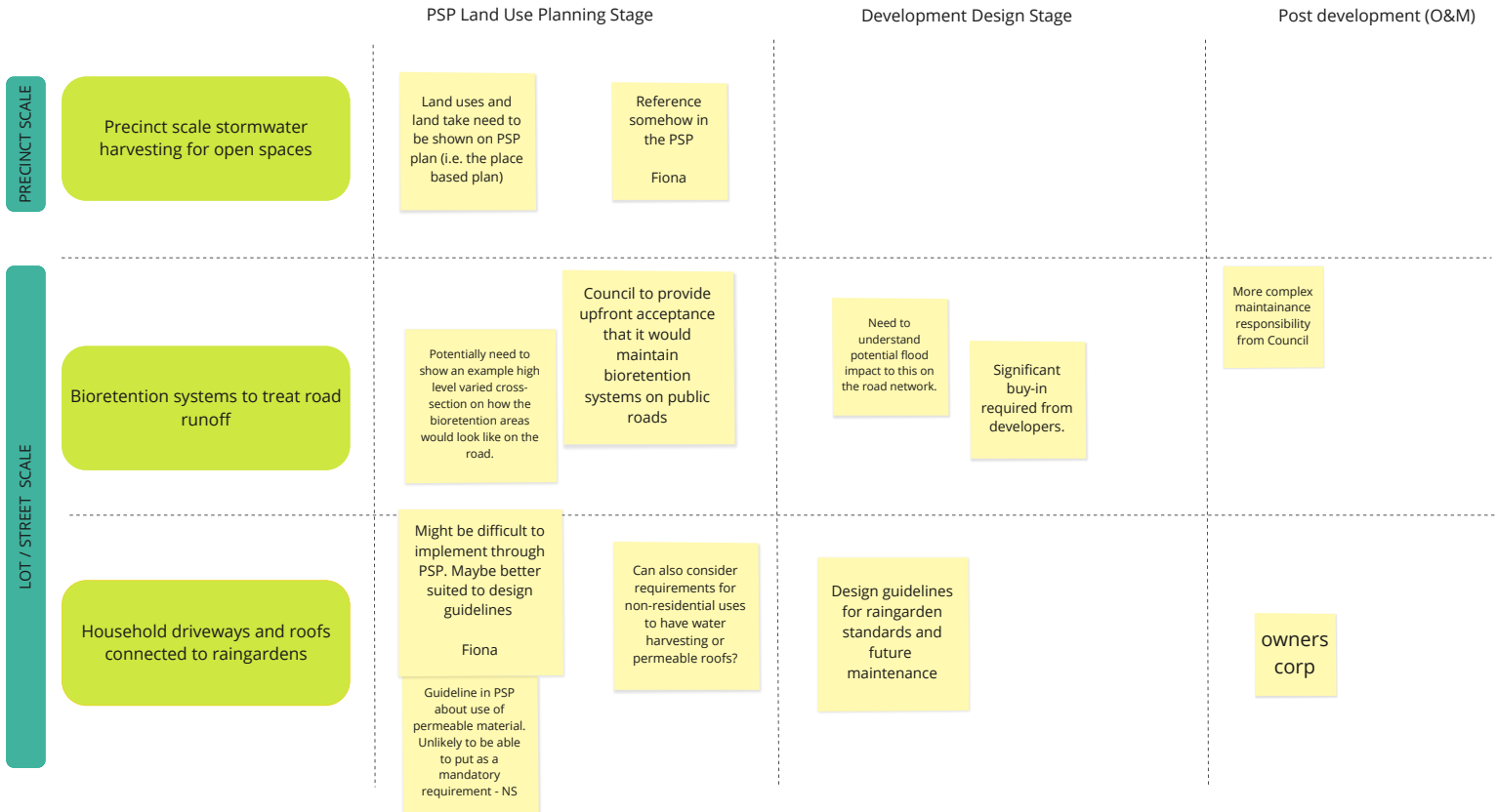


Activity - Delivery Pathways - Meeting stormwater targets

WHAT NEEDS TO BE CONSIDERED AT THE FOLLOWING STAGES?

ARUP

Exercise time
15 minutes



Activity - Delivery Pathways - Burrumbeet Creek revitalisation

ARUP

Exercise time
15 minutes

WHAT NEEDS TO BE CONSIDERED AT THE FOLLOWING STAGES?

PRECINCT SCALE

	PSP Land Use Planning Stage	Development Design Stage	Post development (O&M)
Provide ecological refuge and resilience for flora and fauna residing within Burrumbeet Creek	Acknowledgement that weed control would be a crucial element if refuge and resilience are to be viable This is a nice thing to have but is it achievable? Everything possible should be done to improve the current status of Burrumbeet Creek Need to understand how much larger the wetlands and creek corridor would be if we need to reflect it in PSP plan. e.g. geomorphology assessment a Minimum of a 30m buffer on either side should be required.	Committment to revegetation plans that consider creating and /or enhancing corridors for aquatic and terrestrial species Shouldn't limit our thinking to just supporting threatened species, but consider broader native biodiversity Include condition to follow the GGF design standards.	Ongoing maintenance - weed control
Blue-green corridors within the PSP	Show indicative areas of how blue green corridors can be placed to accomodate overland flow paths. May not be in the PSP but could be shown in a backgroun doc. NS Need commitment from BCC that it would be able to maintain these corridors since it is likely going to be in their ownership - NS Include guideline supporting this in PSP consider how accessible these corridors are to the public	Good design will always take this into account and there is a need for a commitment to achieve this with and its ongoing maintenance with BCC Would need to understand ground conditions / infiltration in order to design corridors Would need to consider how lots and streets connect into the corridor. Can be challenging to keep pipes shallow / near at grade level - AP	
Stormwater harvesting for open space			
Recycled water to homes			

Additional Comments

ARUP

VPA - prefer to be aspirational in this psp

Work with council and stakeholders to make this delieverable

flora and fauna in the 1% flood extents. Would be ideal to maintain this - CMA

maximising open spaces, and locating them strategically. e.g. near ballarat north commons, adjacent to creek - CHW

Leverage proximity to WWTP - CHW

Appendix F

Wadawurrung Traditional Owners Aboriginal Corporation IWM Statement

Dear IWM project leads,

Please see below Wadawurrung Traditional Owners Aboriginal Corporation statement and position on IWM projects and stormwater, recycled water and new water sources.

Wadawurrung people recognize the rivers and waterways on our Country as living entities and we, the Traditional Owners are the voices that speak for their health and well-being.

When we talk about Cultural water and Cultural flows, we are talking about all water that exists on country - because Water is life. Without water, life suffers and ultimately cannot exist.

Cultural flows are Water entitlements that are legally and beneficially owned by volume or by having agency over decisions made, by Indigenous Nations, of a sufficient and adequate quantity and quality to improve spiritual, cultural, environmental, social, and economic conditions of those Nations. Inherently, Cultural flows are for us to Heal Country and to enable us to undertake our obligations to care for country and to bring our lifeblood, water, back to its natural flowing state, so that it can continue to support Country, Culture & Community.

While treated storm water can be used to support environmental flows and systems, treated storm water must not to be used as Cultural Water - it should be used as the re-allocation source for systems in place, freeing up licenses and reducing extraction from natural systems, allowing passing flow management and future water entitlements to be handed back to Traditional Owners.

Two years ago, Wadawurrung released "Paleert Tjaara Dja -Lets make country good together", 10-year Healthy Country Plan. Within this we have built our objectives, aspirations, and obligations for water on Wadawurrung Country.

Our role within the Gobata Dja - Caring for Country team as Aboriginal Water Officers, amongst tangible projects, is paramount to educating the importance of waters connection to Country, and why we must change the western understanding of water management.

Our Rivers and our water bodies are now highly modified and under threat from increased and incorrect usage. They are heavily over allocated and are suffering from everlasting extraction for irrigation, industry, and potable assets.

On Wadawurrung Country, there are no remaining water allocations within our systems. So, what does that leave for Wadawurrung People, our access and agency over Cultural Water?

Zero. Zero litres. Here in lies the challenge for Wadawurrung.

The majority of rivers on Wadawurrung Country are extensively licensed and over sold, while only receiving very small environmental entitlements and very limited passing flows, as a direct result of the building of weirs and barriers harvesting the natural flows and selling to industry.

From Wadawurrungs perspective, rather than continually extract and license water from natural flowing systems, new sources of water like storm water and recycled water, through IWM projects can be used as the asset for sale, on selling it to users like irrigators, golf courses and other major industry.

There is great need for investment into new water sources as we face increased pressure from urbanization, population growth and climate change. Our Rivers cannot support any further take.

We need to increase the confidence of users for alternative water sources so that our waterways can begin to heal, and our Mobs can regain agency over what has always been theirs. There was never Aqua Nullius and it was never an asset for sale.

People must understand that water that exists on Wadawurrung Country, must stay on Country as it is part of the holistic wellbeing of that landscape. It supports all aspects of life, from the deep water and the life within,

to the banks with the river red gums, to the grass lands and bushland surrounding, the canopies and the birds that live above right through to the sky country that feeds the water back into the landscape.

When you turn your tap on in your kitchens, or you water your vegie gardens, or when the irrigators turn their sprinklers on, I want you to imagine the word, Wadawurrung, pouring from the taps and remember, that water is not just an asset for sale, water has its own spirit and its own connection to Country, it needs to be healthy to be able to support Country. Our water is our lifeblood of Country, without water life within Country cannot be.

Please take this statement as our formal and strategic direction with IWM related projects. If opportunities for water to be returned to Country and Wadawurrung are identified, we ask to be kept informed where needed and will engage further when required.

Please use this as a tool to help us mitigate resourcing requirements as we commit to other initiatives.

Thank you and take care.